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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,528	12/28/2005	Xue-Jan Fan	US030215US2	7980

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EXAMINER	
SMITH, COURTNEY L	

ART UNIT	PAPER NUMBER
2835	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,528	FAN ET AL.	
	Examiner	Art Unit	
	COURTNEY SMITH	2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 June 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:
The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. **Claims 1, and 18,** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. **MPEP 2173.05(i) Negative Limitations---** sets forth that any negative limitation must have basis in the original disclosure; wherein specifically excluding the use of an 'additional layer', and thus assertion of: 'with no additional layer between the pad and the trace layer' and 'with no additional layer between the pad and the trace layer, constitutes a negative limitation.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 1, 7, 12-13, and 21-22,** are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)**.

Regarding Claims 1, 12-13 Hagerup discloses a device **(Fig. 4)** for thermal management of an integrated circuit device **(24),** the device comprising: a heat sink **(30);** a substrate **(14)** overlying the heat sink; a trace layer **(26)** overlying and adjacent the substrate; a pad **(where 22 is adjacent and overlies the trace layer)** overlying and adjacent to the trace layer; the pad being operable to mount the IC; and a via **(40)** extending through the substrate, wherein the via is in thermal communication with the trace layer and the heat sink to transfer to the heat sink at least a portion of any heat applied to the trace layer by the semiconductor. **Except, Hagerup** does not explicitly disclose the circuit device is an LED. It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the thermal management device of Hagerup with an LED rather than an integrated circuit chip since it was known in the art that both components are semiconductor devices that produce heat.

Regarding Claim 7, Hagerup discloses a device **(Fig. 4)** of claim 1, wherein the substrate is a flexible substrate **(wherein the disclosed LTCC tape is flexible, as disclosed in Col. 1, lines 40-49).**

Claims 21-22, Hagerup discloses a device **(Fig. 6)** of claim 1, **except** explicitly disclosing the via includes: a copper sidewall defining a channel through the substrate,

the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink, a thermal conductive material filling and/or solder at least a portion of the channel; and the thermal conductive material is different from the material of the sidewall. However, **Nakamura** discloses a copper sidewall **(copper foil--5a-fig. 2)** defining a channel **(5)** through the substrate **(2),** the channel interfacing with the trace layer **(2a, 2b)** to thereby establish the thermal communication between the via, trace layer, and heat sink **(4)**, a thermal conductive material filling and/or solder at least a portion of the channel **(Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder since 3a/3b are solder to the circuit board 2, and Col. 3, lines 24-29 also discloses how heat is thus radiated via through hole 5 and 3a/3b, and Col. 5, lines 56-58 further disclosed 3a and 3b are commonly formed with 5, and thus constitutes at least a portion of the channel);** and the thermal conductive material is different from the material of the sidewall **(as already set forth, whereby the sidewall is portion 5a).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the channel/sidewall of Nakamura in order to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board.

5. **Claim 6**, is rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)** as applied to claim 1 above, in view of **(Washburn 5,064,673).**

Regarding Claim 6, Hagerup discloses a device **(Fig. 4)** of claim 1, **except** explicitly wherein the substrate is a printed circuit board. However, **Washburn** explicitly discloses a substrate is a printed circuit board **(as set forth by Col. 1, lines 30-34).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the substrate of Washburn for a more improved fabrication of electrical connections via trace layers of the printed circuit board between discrete electrical components as opposed to trimming and shaping wire bonded leads etc. **Note: (Background of Invention of Hagerup discloses Washburn 5,604,673 (although, *not incorporated explicitly as a reference*).**

6. **Claims 2-5,** are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)** in view of **(Weber 6,226,183)**.

Regarding Claims 2-4, Hagerup discloses a device **(Fig. 4)** of claim 1, **except** explicitly further comprising: a bonding layer between the substrate and the heat sink. However, **Weber** discloses a bonding layer is a thermally conductive adhesive and/or tape **(7-Fig. 2; Col. 2, lines 16-20; where adhesive and/or adhesive foil constitutes adhesive and/or tape).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the thermal management device of Hagerup with the thermally conductive adhesive/tape of Weber for a more improved heat transfer from the substrate for heat radiation by the heat sink.

Regarding Claim 5, Hagerup discloses a device **(Fig. 4)** of claim 2, wherein the substrate is a multi-layered substrate **(as disclosed by Col. 4, lines 62-67).**

7. **Claims 8-11, 14-19,** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hagerup 6,477,054)** as applied to claim 1 above in view of **(Nakamura 7,054,159). Claims 8-11, 14-17, Hagerup** discloses a device **(Fig. 6)** of claim 1, **except** explicitly disclosing the via includes: a sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink and a thermal conductive material filling at least a portion of the channel. However, **Nakamura** discloses a sidewall **(copper foil--5a-fig. 2)** defining a channel **(5)** through the substrate **(2),** the channel interfacing with the trace layer **(2a, 2b)** to thereby establish the thermal communication between the via, trace layer, and heat sink **(4)** and a thermal conductive material filling at least a portion of the channel **(Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder, since 3a/3b are soldered to the circuit board 2, and Col. 3, lines 24-29 further discloses how heat is thus radiated via through hole 5 and 3a/3b).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the via of Nakamura in order to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board.

Regarding Claims 18-19, Hagerup discloses a device **(Fig. 4)** for thermal management of an integrated circuit device **(24),** the device comprising: a heat sink **(30);** a substrate **(14)** overlying the heat sink; a trace layer **(26)** overlying and adjacent the substrate; a pad **(where 22 is adjacent and overlies the trace layer)** overlying and adjacent to the trace layer; the pad being operable to mount the IC; and a via **(40)** extending through the substrate, wherein the via is in thermal communication with the trace layer and the heat sink to transfer to the heat sink at least a portion of any heat applied to the trace layer by the semiconductor. **Except, Hagerup** does not explicitly disclose the circuit device is an LED; nor does Hagerup explicitly disclose the via includes: a sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink and a thermal conductive material filling at least a portion of the channel. However, **Nakamura** discloses a sidewall **(copper foil--5a-fig. 2)** including defining a channel **(5)** through the substrate **(2),** the channel interfacing with the trace layer **(2a, 2b)** to thereby establish the thermal communication between the via, trace layer, and heat sink **(4)** and a thermal conductive material filling at least a portion of the channel **(Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder, since 3a/3b are soldered to the circuit board 2, and Col. 3, lines 24-29 further discloses how heat is thus radiated via through hole 5 and 3a/3b).** It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the sidewall/channel

of Nakamura in order to increase the surface area of the channel/sidewall; wherein allowing for more effective heat transfer and bypassing the circuit board. It would have been further obvious to one having ordinary skill in the art at the time that the invention was made to modify the thermal management device of Weber with a LED rather than a semiconductor device since it was known in the art that both components are semiconductor devices that produce heat.

8. **Claim 20,** are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)** in view of **(Nakumura 7,054,159)** in further view of **(Weber 6,226,183)**.

Regarding Claim 20, Hagerup discloses a modified device **(Fig. 4)** of claim 1, **except** explicitly further comprising: a bonding layer between the substrate and the heat sink. However, **Weber** discloses a bonding layer is a thermally conductive adhesive and/or tape **(7-Fig. 2; Col. 2, lines 16-20; where adhesive and/or adhesive foil constitutes adhesive and/or tape)**. It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the modified thermal management device of Hagerup and Nakumura with the thermally conductive adhesive/tape of Weber for a more improved heat transfer from the substrate for heat radiation by the heat sink.

Response to Arguments

9. Applicant's arguments with respect to claims 1-22 have been considered but are moot in view of the new ground(s) of rejection. **Regarding Claims 1, and 18;** new rejections have been made under 112 1st paragraph since negative limitations have been asserted that are not substantiated by the specifications.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Courtney L. Smith whose telephone number is 571-272-9094. The examiner can normally be reached on Monday-Friday 7:30a-5p (1st Fri. off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jayprakash Gandhi can be reached on 571-272-3740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C. L. S./

/Jayprakash N Gandhi/

Supervisory Patent Examiner, Art Unit 2835